

Qu 1	Scheme	Marks	AO
(a)	$2 \times 4.2, 4 \times 4, 4 \times 3.5, 10 \times 1$ ($= 8.4 + 16 + 14 + 10 = 48.4$) [So $P(10 < T < 30) =] \left[\frac{48.4}{90} \right] = \frac{121}{225} = 0.53777\dots$ 0.53~0.54 (2sf OK)	M1 A1	1.1b 1.1b
(b)	(Not suitable as) data is not symmetric <u>or</u> is skew (normal is symmetric) ("Even" distribution or a diagram <u>on its own</u> is not enough so B0)	B1 (1)	2.4
(c)	$\int xe^{-x} (dx) = \int xd(-e^{-x})$ $= [-xe^{-x}] - \int(-e^{-x}) (dx) (+c)$ $\int_0^n xe^{-x} (dx) = [-xe^{-x} - e^{-x}]_0^n = (-ne^{-n} - e^{-n}) - [-(0) - 1]$ $= 1 - (n+1)e^{-n} (*)$	M1 A1 dM1 A1cso*	2.1 1.1b 1.1b 1.1b
(d)	Require area = 90 i.e. $k \int_{(0)}^{(n)} xe^{-x} dx = 90$ (ignore limits) Using the result in part (c) with $n = 4$ gives $k[1 - 5e^{-4}] = 90$ ($k =$) 99(.0729...) (*)	M1 M1 A1cso*	3.1a 2.1 1.1b
(e)(i)	[$P(10 < T < 30) =]$ 0.64863... awrt 0.649	B1	1.1b
(ii)	[No. of patients =] $(99)[(1 - 4e^{-3}) - (1 - 2e^{-1})]$ ($= 53.1..$) Prob = $\frac{0.5366\dots \times 99}{90} = 0.59027\dots$ [or 0.5907...] = awrt 0.590 or 0.591	M1 A1	3.4 3.2a
(f)	eg Patients might stay longer than 40 hours (Can ignore other comments unless clearly contradictory.)	B1	3.5b
		(14 marks)	
Notes			
(a)	M1 for an attempt to find the number between 10 and 30 (2 correct products or 48 or 48.4 seen) A1 for 2sf answer in [0.53 ~ 0.54] NB use of 48 gives 0.5333... [Correct ans implies 2/2]		
(b)	B1 for a comment suggesting not suitable based on (lack of) symmetry <u>or</u> "not bell shaped"		
(c)	1 st M1 for attempting integration by parts in right direction. Must have $u = x$ and $v = \pm e^{-x}$ 1 st A1 for a correct first step, correct first integration and expression for second integral 2 nd dM1 (dep on 1 st M1) for all integration attempted and some use of at least one limit * 2 nd A1 for cso with no incorrect working seen. Minimum is correct int and use of limits seen.		
(d)	1 st M1 for realising need area under the curve (implied by the integral) = 90 2 nd M1 for use of (c) with $n = 4$ and set = 90 May be implied by sight of 99.07... or better * A1cso for $k = 99$ or awrt 99.1 NB Allow use of $k = 99$ and show area = awrt 89.9 with a conclusion to score 3/3		
(e)(i)	B1 for awrt 0.649		
(ii)	M1 for use of (c) with $n = 1$ and $n = 3$ Don't need the 99. Implied by sight of awrt 0.54 A1 for awrt 0.590 or awrt 0.591 Allow 0.59 from correct working seen.		
(f)	B1 eg for comment, in context, about the upper limit for <u>time</u> (t or x)(time/hour may be implied)		